Prevention of postoperative pulmonary complications in the hypoxaemic patient – gathering the evidence for noninvasive respiratory support

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Postoperative pulmonary complications are among the most common morbidities encountered in the postsurgical patient. A large body of literature has been published regarding the use of noninvasive ventilation for the treatment and prevention of such complications. This joint ESA-ESICM guideline brings together known studies and applies GRADE methodology to make recommendations regarding the use of noninvasive respiratory support techniques in the perioperative/periprocedural hypoxaemic patient.[1] Noninvasive respiratory support was defined as High flow nasal cannula (HFNC), noninvasive positive pressure ventilation (NIPPV) or continuous positive airway pressure (CPAP).

Five major lines of inquiry were explored to: 1) determine the goals of therapy 2)identify populations in which therapy may be beneficial 2)assess minimal standards of haemodynamic and respiratory monitoring 4)identify ways of preventing avoidable complications in patients receiving noninvasive respiratory support and 5)identify how and where to initiate therapy. It should be noted that the guidelines address treatment of patients with hypoaexamia (defined as PaO2/FiO2<40kPa), rather than respiratory support as prophylaxis for pulmonary complications.

The authors note that the majority of studies compared noninvasive respiratory support and conventional oxygen therapy, and that there were few comparisons between HNFC, NIPPV and CPAP.

The evidence supports the use of NIPPV over conventional oxygen therapy (COT) to improve oxygenation (Grade 1B recommendation), reduce atelectasis (2C), reduce pneumonia (2A), avoid reintubation (2B) and reduce mortality (2C). There was little evidence to support the use of HFNC for these outcomes.

For abdominal surgery the use of NIPPV instead of COT in patients with hypoxemia is suggested to prevent reintubations, shorten ICU stay and ventilator days, and reduce infections, supported by 2 RCTs (Grade 1B). The evidence was less clear for HNFC, with a grade 2C recommendation based on a single large multicenter RCT demonstrating the noninferiority of this method. Similarly weak recommendations based on poor evidence were made for patients undergoing lung resection and solid organ transplants. For fiberoptic bronchoscopy there was moderate quality evidence for the use of CPAP or NIPPV to reduce post-procedural pulmonary complications.

Minimal standards recommendations were made for clinicians with recognized skills and competence for airway management and ventilation of patients with lung injury (2C) but these were not based on evidence. Similarly, the weak recommendation of periodic assessments, physiological monitoring and blood sampling were also based on clinical judgement of the panel in the absence of available studies to support the use of these methods.

Importantly, no recommendations were made for the prevention of complications in patients receiving various types of respiratory support, as the panel could not identify any study addressing this purpose. The guidelines make a weak recommendation (2B) for the use of HFNC instead of COT in patients unable to tolerate other forms of noninvasive ventilation.

Finally, there were no recommendations regarding how or when to initiate noninvasive respiratory support.

Although these guidelines were careful to only include studies of hypoxaemic patients, the findings seem at odds with a Cochrane review that suggested a benefit of CPAP initiated during the postoperative period for reduction of postoperative atelectasis, pneumonia and reintubation, but with unclear effects on mortality, hypoxia or need for invasive ventilation in adults undergoing elective major abdominal surgery (very low strength of evidence).[2] The discrepancy in these findings is likely related to the prerequisite of 'hypoxaemia' in the current study.

The authors have been careful to state the major limitations of the current recommendations, including the lack of head-to-head comparisons between the different noninvasive techniques, use of respiratory support outside the ICU, and lack of information regarding surgical complications. The use of noninvasive positive pressure ventilation after gastric and oesophageal surgery remains controversial and was identified as an important gap in knowledge.

Readers should be cognizant that the present guidelines do not address the *prevention* of postoperative pulmonary complications using noninvasive respiratory support (ie. including patients without manifest hypoxaemia). In this regard we await the results of the multicenter PRISM trial that is designed to evaluate the preventive use of CPAP, commencing immediately after the completion of major abdominal surgery and continuing for at least four hours (www.prismtrial.org).

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